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AUTHOR Stromswold, Karin
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ABSTRACT

A study of children's acquisition of the auxiliary verb system in English is reported. The first section describes the operation of the auxiliary system, and proposes that the behavior of auxiliaries is so complicated that if children were to generalize from one auxiliary to another, they would make predictable errors. The second section reviews data from a large corpus of young children's language for evidence of auxiliary errors. From this data, it was determined that inversion errors are the only auxiliary errors made with appreciable frequency. Based on the scarcity of most error types, it is concluded that children acquire most aspects of the auxiliary system conservatively, and that little evidence of a productive learning strategy emerges from this data. Further research on time factors in the acquisition of the various auxiliaries is recommended to complement these findings. (MSE)

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How Conservative are Children?: Evidence from Auxiliary Errors*

Karin Stromswold

Massachusetts Institute of Technology and Harvard Medical School

Introduction. The auxiliary system has received considerable attention from linguists and researchers studying language acquisition. One of the reasons for this attention is that the behavior of auxiliaries is very complicated; while certain syntactic and semantic traits are associated with many auxiliaries, some auxiliaries do not exhibit these traits. Linguists have tried to address the question of why the auxiliary system is so complicated or, less ambitiously, how its behavior can be described. Researchers studying language acquisition have attempted to explain how children simultaneously learn the generalizations and restrictions on auxiliary order, combination, inflection, and placement (c.f., Baker, 1981, Pinker, 1984). In this paper, I will focus on how children acquire the auxiliary system.

The child learning the English auxiliary system could adopt various strategies. At one extreme, she could acquire the auxiliary system productively, generalizing what she knows about the behavior of one auxiliary to another auxiliary. If she is too productive, however, she will make many mistakes. Consider, for example, what would happen if she generalized the behavior of *do* to *can*. If she did, she might notice that in the sentence *he does not eat* the auxiliary *do* agrees with the subject *he* and from this erroneously conclude that *can* should also agree with its subject. This would cause her to say things like **he cans eat*. At the other extreme, the child could adopt a conservative strategy and refuse to make any generalizations about the behavior of auxiliaries. She would learn the entire auxiliary system by rote, producing only those constructions which had been positively attested to in the input. If she adopted this strategy, she would make no errors. However, her acquisition of the auxiliary system would be extremely slow and protracted since she would never transfer what she knows about one auxiliary to another auxiliary.

In this paper, I make the following 3 point argument. In Section 1, I argue that the auxiliary system is so complicated that, if children were to generalize from one auxiliary to another, they would almost certainly make errors. In Section 2, I present the results of a search of a large corpus of children's speech which indicates that inversion errors are the only type of auxiliary error that children make with any appreciable frequency. In Section 3, I argue that the paucity of most types of auxiliary errors suggests that children acquire most aspects of the auxiliary system conservatively.

1. Description of the Auxiliary System

The following review of the auxiliary system is not meant to be a complete summary of the linguistic behavior of the auxiliary system. Rather, it is designed to give the reader a feel for the complexities of the auxiliary system.

Types of auxiliaries.

There are 5 basic kinds of auxiliaries. The first subtype is the progressive *be* (e.g., the *is* in

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she is eating). The second subtype is the passive *be* (e.g., the *was* in *he was killed*). Not all instances of *be* are auxiliaries, however. For example, the *is* in *she is happy* is a copula, not an auxiliary. Likewise the action proverb *being* in *she was being naive* is not an auxiliary. The third subtype of auxiliary is the aspectual *have* (e.g., the *have* in *they have been eating*). Again not all instances of *have* are auxiliaries. The *have* in the sentence *they have food* is a main verb denoting possession. The fourth subtype of auxiliary is the auxiliary *do* (e.g., the *do* in the sentence *I do not eat*). The auxiliary *do* must be distinguished from the proverb *do* found in sentences like *I do this*. The fifth subtype of auxiliaries are the modal auxiliaries. The modals include *can*, *could*, *will*, *would*, *shall*, *should*, *may*, *might*, and *must*. The modals *can* and *will* must be distinguished from their homophonic main verb counterparts such as those found in the sentences *he canned peas* and *he willed her to come*.

In addition to these true auxiliaries, there are a group of verbs that exhibit some isolated auxiliary-like traits. I will refer to these verbs as pseudoauxiliaries. Examples of pseudoauxiliaries include the verbs *need*, *better*, *gonna*, *wanna*, and *gotta*. In many ways pseudoauxiliaries semantically and syntactically resemble modal auxiliaries. One can say, for example, *you better go*, *you better not go*, *you better be going*, *you better have been going*, etc.. If one replaces the word *must* for *better*, the resulting sentences have the same structure and similar meaning as the sentences with *better*. Notice, however, that every pseudoauxiliary lacks certain behaviors which most modal auxiliaries exhibit. For example, *need* must be negated (e.g., one can say *you need not go* but not **you need go*). In addition, most pseudoauxiliaries cannot appear before a negation marker (e.g., **you gonna not go*, **you gotta not go*, etc.). Finally, no pseudoauxiliary can appear before a subject (e.g., **better you go?*, **gonna you go?*, etc.).

Restriction on auxiliaries

For ease of exposition, I will divide the restrictions on the behavior of auxiliaries into 4 types: inflectional restrictions, combination restrictions, order restrictions, and inversion restrictions.

Inflectional restrictions. With the exception of modal auxiliaries, all auxiliaries agree with their subjects (subject-verb agreement, or SVA). Thus, for example, one can say *she is going* but not **she are going*. A second inflectional restriction is that the only auxiliary that can take the progressive *-ing* inflection is the passive *be* (for example, the *being* in *he is being traded to the Mets*). One can't say **musting*, **ising*, **didding*, or **hadding*. Furthermore, while *having*, or *doing* are acceptable, they are acceptable only as main verbs.

Combination restrictions. In general, most of the possible combinations of auxiliaries are not acceptable. For example, one can say *I could have eaten a horse*, but one cannot say **I could eaten a horse*. Even within subtypes of auxiliaries, some combinations are acceptable whereas others are not. For example, the combination of modal + aspectual *have* is acceptable for all modals except *can*. Sentences like **I can have eaten*, **I can have been eating*, **I can have been kicked*, and **I can have been hungry* are unacceptable even though these same sentences would be grammatical with any other modal. Another example of restrictions within a subtype of auxiliary is the cliticization of the negation marker *not*. The contracted form of *not* (*n't*) can cliticize onto all forms of *be* except *am* (i.e., one can say *isn't*, *aren't*, *wasn't*, *weren't*, but not **amn't*). Among the forms of the auxiliary *do*, only *don't* is irregular (i.e., one says *didn't* and *doesn't* but not **do-n't*). All of the modals except *will*, *shall*, and *may* have regular contracted forms (i.e., one cannot say **willn't*, **shalln't*, and **mayn't*).

Order restrictions. The subtypes of auxiliaries are strictly ordered as follows:

<MODAL> <HAVE> < PROGRESSIVE BE> <PASSIVE BE>

One can best appreciate this ordering in sentences which contain all of the subtypes of auxiliaries. Consider, for example, the sentence *he must have been being tortured the entire time he was in jail.*

Notice that if one switches the order of any of the auxiliaries, the sentence is ungrammatical (e.g., **he must have being been tortured* . . . , etc.). A second order restriction is that if there is a tense or SVA inflection, it must appear on the first auxiliary. A third restriction is that, if the content of the entire sentence is to be negated, the negation marker must follow the first auxiliary.[1]

Inversion Restrictions. Lastly, there are restrictions which determine whether a subject appears before an auxiliary or whether the order is inverted. In questions, the left-most auxiliary and the subject invert in matrix questions but not in embedded questions or in *how come* questions.[2] Thus, for example, *when can he go?* is a grammatical matrix question, whereas **when he can go?* is not. In embedded questions and *how come* questions the auxiliary and subject do not invert. Thus, *I wonder if he can go* and *how come he can go?* are grammatical, whereas the inverted **I wonder if can he go* and **how come can he go?* are ungrammatical.

Things are not that simple, however. The first complication is that some non-auxiliaries can invert. In all modern dialects of English, the copula inverts. Thus, one can say *is she happy?* even though *is* is not strictly an auxiliary. If the inversion rule were simply that only the first auxiliary can invert, we would expect *do*-support to be necessary. In other words, we would expect **does she be happy* to be the grammatical way to question the sentence *she is happy*. Additionally, in United Kingdom dialects of English, the main verb *have* can invert (e.g., *have you a match?*).[3] A second complication is that most pseudoauxiliaries cannot invert (e.g., **better you go?*, **gonna you go?*, etc.).

The above suggests that the behavior of auxiliaries is extremely complicated. The auxiliary system seems to be filled with linguistic landmines waiting for the child who makes the wrong generalizations. Before I proceed to examine the errors children make, I will give a few examples of generalizations a child learning English might make and the errors that would result from these generalizations. First, based on the prevalence of auxiliaries that are homophonic with main verbs (see above), the child might conclude that there was no difference between main verbs and auxiliary verbs. If she did this, she would make many errors. One type of error which is uniquely predicted by this model, is that she would either invert main verbs (if she generalizes the behavior of auxiliary verbs) or not invert auxiliary verbs (if she generalizes the behavior of main verbs). Another possibility is the child might notice that all auxiliaries exhibit subject-auxiliary inversion and from this conclude that all auxiliaries belong to a single subtype. If she did this, she would not make the inversion errors above, However, we would still expect her to either fail to add the SVA marker to nonmodals (if she generalized the behavior of modals) or add it to modals (if she generalized the behavior of nonmodals).

Based on the fact that *be*, *have*, and *do* exhibit SVA whereas the modals do not, the child might decide that *be*, *have*, and *do* all belong to a single subtype of auxiliaries which is distinct from the modal subtype. If she did this, she would not make the SVA errors outlined above. However, she would still use illicit combinations and orderings of the *be*, *have*, and *do* auxiliaries. This would happen because sentences like *he must have been being tortured* would lead her to conclude that English permits a sentence to contain up to three members of the *be-have-do* subtype. Hence, she would produce ungrammatical sentences like **I had have going*, or **I being been tortured*.

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[1] One can say, for example, *I could have not been late*, but semantically what seems to be negated isn't the entire utterance, but rather the "been late" portion.

[2] The auxiliary can also occur before the subject in exclamatives (e.g., *can she cook!*) and negative polarity sentences (e.g., *Never have I seen such a mess*). Because these forms are very rare in early speech, they will not be discussed.

[3] It probably isn't the case that U.K.-English possessive inverts because it is a full-fledged auxiliary. Unlike a true auxiliary, it can appear as the sole verb in a sentence (e.g., *they have apples*). Furthermore, sentences in which possessive *have* precede an uncontracted *not* sound stilted at best (e.g., **?I have not any apples*).

2. Auxiliary Errors Made by Children

In Section 1, I outlined some of the types of auxiliary errors we would expect children to make if they generalized the behavior of one auxiliary to another auxiliary. I conducted analyses of the auxiliary errors in children's speech to determine which, if any, auxiliary errors children make.

Corpus. I searched for auxiliary errors in the ChiLDES transcripts (MacWhinney and Snow, 1985) of the 14 children shown in Figure 1. I used the UNIX utility "fgrep" to cull all of the children's lines which contained an auxiliary or a negation marker.[4] This yielded a corpus which contained approximately 55,700 uses of auxiliaries[5] and 15,000 uses of negation markers.

Figure 1: Child Transcripts Analyzed

Corpus collected by	Child	Age range	Approx. # of Aux's
Bloom (1973):	Allison	1;4-2;10	200
	Peter	1;10-3;2	5,200
Brown (1973):	Adam	2;3-5;2	11,600
	Eve	1;6-2;3	1,800
	Sarah	2;3-5;1	6,900
Clark (1978):	Shem	2;3-3;2	2,500
Higginson (1985):	April	1;10-2;11	1,200
	June	1;3-1;9	200
	May	0;11-0;11	0
MacWhinney & Snow	Mark	1;5-6;0	2,100
(1985):	Nathan	2;6-3;9	1,700
	Ross	2;10-7;10	11,700
Sachs (1983):	Naomi	1;2-4;9	3,100
Suppes (1973):	Nina	2;0-3;3	7,500
Total number of auxiliaries			55,700

Procedure. I went through the corpus of utterances which contained auxiliaries or negation markers looking for mistakes involving auxiliaries or negation. In addition, for each question that contained a subject and an auxiliary, I determined whether the auxiliary was inverted. Utterances that had contracted, stuttered, or unclear auxiliaries and utterances which were obvious routines or imitations were not included in the error analyses or inversion analyses. An undergraduate research assistant did

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[4] The computer searched for lines which contained the following letter strings: *am, are, be, better, can, could, do, did, gonna, gotta, had, has, have, is, may, might, must, need, never, no, not, n't, shall, should, was, were, will, won't,* and *would.*

[5] Note that occurrences of copula *be*, and main verb *have* and *do* are included in these tallies.

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the same analyses for a subset of the auxiliary and negation corpus. For all analyses, the concordance ratings were greater than 90%.

Results

A Inflectional Errors.

Illicit Inflectional Endings. There was only one example of a child appending an illicit inflectional marker to an auxiliary. Children never applied the SVA marker to modals (i.e., there were no examples like **he cans go*). Likewise, children never applied the progressive *-ing* inflection to a modal (i.e., there were no examples like **musting*). Furthermore, while the children frequently said *doing*, *being*, and *having*, there was one example in which a child added the progressive inflection to an auxiliary *do*, *have*, or *be* (Eve 2;0: while me [/] while me being sitting on it).

Overregularization. Many auxiliaries have past tense and SVA forms which are irregular. Notice, for example, that one says *she was eating* rather than **she be-d eating* and *she is eating* rather than **she be-s eating*. It is well-known that children often go through a stage during which they say "eated" for "ate" and "sayes" for /sez/ (c.f., Pinker & Prince, 1988, for a review). Unless children are completely conservative in their acquisition of auxiliaries, we would expect them to occasionally produce overregularized past tense and SVA forms. I found no such examples. Children made no errors with modals (i.e., they never said "canned" for "could"). I found 28 overregularized forms of *do*, *have*, and *be*, but in all 28 cases the overregularized verb was a main verb and not an auxiliary. In addition, I found 134 cases in which children used *be* where they should have used *is*, *are*, or *am*. In 128 of 134 examples, *be* was a copula and not an auxiliary.

In summary, the children made essentially no inflectional errors with auxiliaries. They made no auxiliary errors despite the fact that they inflected and overregularized main verbs which were homophonic to auxiliaries.

B. Combination Errors.

Illicit Combinations of Auxiliaries. As was discussed in Section 1, most combinations of auxiliaries are not allowed. Despite this fact, there were only 30 cases of what appear to be illicit combinations of auxiliaries in questions. All of the examples of illicit auxiliary combinations in questions involved having an auxiliary both before and after the subject. Thirteen of the 30 examples had the copula *be* (e.g., Adam (3;4): is it was a snake?) rather than a "true" auxiliary. Among declarative sentences, there were only a half dozen cases which could be examples of illicit combinations of auxiliaries. All but one of these examples involved a copula (i.e., all but one were similar to Adam (2;7): you don't be quiet). Given that the combination modal+aspectual *have* is acceptable for all modals except *can*, one might expect that errors like **I can have gone* would be particularly common. This was not the case. I found 40 modal+aspectual *have* utterances but none of them used the modal *can*. This is despite the fact that the children used *can* more frequently than any other modal.

Illicit Combinations of Auxiliaries and Inflections. In addition to most combinations of auxiliaries being ungrammatical, most combinations of auxiliaries and inflected main verbs are unacceptable. Therefore, I searched for ungrammatical combinations of auxiliaries and inflections. I only counted examples which were ungrammatical because of the presence of an

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extraneous inflection or auxiliary (e.g., Adam (2;7) cowboy did fighting me).[6] I found that fewer than 0.1% of children's questions were double-tensed. Double-tensing was even rarer among declaratives. Furthermore, there were 10 cases like **does she going?* where *do*-support was incorrectly provided in questions. Likewise, judging from context, there were fewer than 20 cases where children incorrectly provided a *do* in an unemphatic declarative sentences. In other words, there were very few examples like *I do taste dem* (Sarah; 3;0).

Auxiliary + *n't*. The negation marker can cliticize onto most but not all auxiliaries; **amn't*, **do-n't*, **mayn't*, **shalln't*, **willn't* are not acceptable. I found only one case of *amn't* and one case of *willn't* among the almost 15,000 uses of negation markers.

In sum, there were very few illicit combinations of auxiliaries despite over 55,000 possible opportunities. The frequency of children's auxiliary combination errors does not appear to be dramatically greater than what one would expect to find in adult speech. When adults make auxiliary combination errors, these errors are obviously production errors and not the result of a faulty grammar. Since children's errors are no more frequent than adult errors, one could argue that they are production errors just like the adult errors.

C. Word Order Errors Other than Inversion Errors.

Auxiliary Order. In utterances that had more than one auxiliary, children never scrambled the relative order of the auxiliaries.

Misplaced Inflection. In all but 10 of the children's utterances which had auxiliaries and a tense or SVA inflection, the inflectional marker appeared on the first auxiliary.

Negation. Children placed a negation marker after a main verb in only 5 utterances. In other words, they essentially never said things like **he taking not all of de walls down* (Adam, 3;5).

D. Inversion Errors

Which Verbs Can Invert. There were no examples of the children inverting pseudoauxiliaries. In other words, they never asked questions like **Better I go?* In addition, I found only 10 questions in which children inverted a main verb (e.g., *where goes one?*). Conversely, children never placed *aren't* after *I* (e.g., **I aren't going*) even though there were 22 questions in which children placed *aren't* before *I* (e.g., *Aren't I going?*).

What Settings Allow Inversion. The children sometimes failed to invert in settings which require inversion. In 8% of the matrix questions that had auxiliaries, children placed the subject before the auxiliary (e.g., Adam (3;3): What I will read?). Furthermore, all of the children who asked at least 25 questions with auxiliaries made this mistake at least once. The children also sometimes inverted where they shouldn't have. They inverted subject and auxiliary in 6% of the embedded questions that had auxiliaries (e.g., Adam (4;3): I wonder what are dese for?). In addition, they inverted subject and auxiliary in 14% of how come questions that had auxiliaries (e.g., Adam (4;10): How come is dat?).

In summary, inversion errors were by far the most common and pervasive type of auxiliary error. However, not all possible types of inversion errors occurred. For example, the children

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[6] I did not count examples which were ungrammatical because an inflection or an auxiliary was missing (e.g.,**she playing* or **she is play*) because such examples are likely to be the result of a production constraint.

essentially never inverted verbs which are uninvertible. They did make two types of inversion errors: they occasionally neglected to invert in settings that required inversion, and they permitted inversion in settings that do not allow inversion.

3. Discussion

In Section 1, I argued that the linguistic behavior of auxiliaries is so complex that, if children generalized from one auxiliary to another, they would almost certainly make errors. In Section 2, I presented the results of analyses of over 55,000 spontaneous uses of auxiliaries by children. The results of these analyses suggest that inversion errors are the only type of auxiliary error that children make with any appreciable frequency. I would like to argue that the scarcity of most types of auxiliary errors suggests that children acquire most aspects of the auxiliary system conservatively. It is possible that this pattern of errors reflects different acquisitional strategies. These different acquisitional strategies might in turn reflect a linguistic difference between most of the properties associated with the auxiliary system and auxiliary inversion.

This pattern of errors is consistent with the following linguistic model. The lexicon could contain a list of which inflected forms, combinations, and orders of auxiliaries are acceptable.[7] The lexicon could also contain a list of which auxiliaries can invert. Because these lists are finite, children could learn them essentially by rote. It is not possible, however, to list all of the sentence strings which permit the auxiliary to appear before the subject (e.g., *is the man eating*, *is the big man eating*, *is the big ugly man eating*, etc.). Inversion seems to be the result of a syntactic process which can occur in some settings and not others. Whether an invertible auxiliary does invert depends on restrictions on when this syntactic process can occur. Children must learn what these restrictions are.

The rarity of most types of auxiliary errors is consistent with children acquiring the auxiliary system in a conservative fashion. The lack of errors does not, however, prove that children are conservative learners. It could be that children do generalize, but that they are either extremely lucky or the generalizations they make are fairly conservative. Given that I searched over 50,000 uses of auxiliaries for errors, it is unlikely that the children just happened not to make most of the possible types of errors. A more likely possibility is that children are extremely smart about the generalizations they make. Notice that all the members of the *be* subtype, the *do* subtype, and the *have* subtype behave pretty much like one another. Children could fairly safely generalize within each of these subtypes.

The modal subtype, on the other hand, poses a number of problems for generalization. One problem with generalizing within the modal subtype is that the pseudoauxiliaries (which by definition lack certain auxiliary-like traits) behave most like the modals. If children generalize the behavior of modals to pseudoauxiliaries, they would do things like invert pseudoauxiliaries. Alternatively, if they generalized the behavior of pseudoauxiliaries to modals, they would fail to invert modals. A second problem with the modals is the fact that utterances with *can* + aspectual *have* are unacceptable even though every other modal can be combined with aspectual *have*. If children were wary about generalizing within the modal category, they would be able to avoid these potential errors.

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[7] Schachter (1983) and Pinker (1984) have suggested that one feature determines which inflectional forms, combinations and orders of auxiliaries are acceptable. If they are right, then the lexicon would merely have to list the values for this one feature. This would simplify the lexicon and, hence, acquisition. It would also lead one to expect that inflection, combination and order errors would cluster.

Negation presents another serious problem for the nonconservative learner. First, some auxiliaries can only appear with negation markers. For example, one can say *you need not go*, but one cannot say **you need go*. Second, the negative marker cannot cliticize onto *am* or *may*, and *shall* and *will* have irregular negated forms. Third, *aren't* can appear before the pronoun *I* but not after it (e.g., *aren't I going?* but not **I aren't going*). Finally, certain negated forms of auxiliaries have different connotations depending on whether they appear before or after the subject.[8]

In the transcript analyses, I found that the children overregularized past tense and SVA inflections for *be*, *do*, and *have* when *be*, *do*, and *have* are main verbs but not when they are auxiliary verbs. This suggests that from a very early age they distinguished main verbs from auxiliary verbs. It also suggests that they applied a productive learning strategy to main verbs and a conservative learning strategy to auxiliary verbs. How were they able to distinguish main verbs from homophonic auxiliary verbs? Perhaps they were able to distinguish main verbs from auxiliary verbs because the two classes of verbs are part of Universal Grammar. It is even possible that the different subtypes of auxiliary verbs are part of Universal Grammar. To the extent that children are born expecting to encounter different categories of verbs, they might be able to use a productive learning strategy without making many errors.

In summary, the analysis of children's auxiliary errors provides little or no evidence of a productive learning strategy. However, it may be that there are no errors because children make exactly the right generalizations. In addition to looking at auxiliary errors, one may be able to determine whether children are conservative or productive by examining the acquisitional time course for the various auxiliaries. For example, one could determine whether all of the members of an auxiliary subtype exhibit certain linguistic behaviors at the same time. One could also determine whether auxiliaries that are acquired late immediately exhibit all of the traits associated with that subtype of auxiliary or whether these traits have to be learned anew for each new modal. These analyses would complement the error analyses presented here. Together they should help reveal how conservative children are in their acquisition of the auxiliary system.

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[8] Compare, for example, the meanings of *won't* in *you won't go* and *won't you go?*

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